Influence of pH on (zinc) protoporphyrin IX formation in dry fermented sausages assessed using a fast screening method

Hannelore De Maere[1,2], Eveline De Mey[2], Lore Dewulf[2], Ilse Fraeye[2], Sylvie Chollet[1], Hubert Paelinck[2]

[1]Food Quality Laboratory, Groupe ISA, Lille-Cedex, France

[2]KU Leuven, Department of Microbial and Molecular Systems, Research Group for Technology and Quality of Animal Products, member of Leuven Food Science and Nutrition Research Centre (LFoRCe), Ghent, Belgium

INTRODUCTION

GENERAL KNOWLEDGE

Myoglobin

+

nitrite/ nitrate

⬇

nitrosyl myoglobin

red colour of cured uncooked meat products

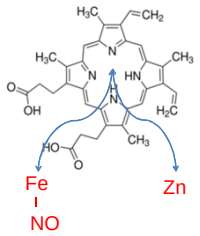

Figure 1. metalation of protoporphyrin IX, the prosthetic group enclosed by myoglobin

Myoglobin

-

nitrite/ nitrate

⬇

zinc myoglobin

red colour of dry cured meat products e.g. Parma ham

POTENTIAL

Myoglobin

-

nitrite/ nitrate

⬇

zinc myoglobin

red colour of other nitrite free dry and/ or fermented meat products

AIM OF THIS RESEARCH

pH is one of the most important factors influencing the formation of zinc protoporphyrin IX in meat products

⬇

Influence of pH on (zinc) protoporphyrin IX formation in dry fermented sausages

EXPERIMENTAL

4 variations of dry fermented sausages (n=3):

- addition of 0.00% (A), 0.25% (B), 0.50% (C), 0.75% (D) dextrose
- sampling at day 0 (production day), 21 (end of production), 45, 64, 177 (extra drying)

Fast screening method:

Excitation of samples in a darkened room using LEDs (420 nm), capturing fluorescence emission of protoporphyrin IX (630 nm) and zinc protoporphyrin IX (590 nm) with a digital camera, visualizing by using image analysis.

Table 1. Evolution of pH of 4 variations dry fermented sausages, using 0.00% (A), 0.25% (B), 0.50% (C) and 0.75% (D) dextrose. Data are expressed as means ±stdev (n = 9), different superscripts indicate significant differences at p<0.05 within sampling days.

Sampling day	Variation			
	A	B	C	D
Day 0	5.69±0.03 ^{a,b}	5.66±0.02 ^{a}	5.70±0.03 ^{b}	5.72±0.02 ^{b}
Day 21	5.33±0.03 ^{d}	4.96±0.01 ^{c}	4.83±0.07 ^{b}	4.66±0.02 ^{a}
Day 45	5.49±0.07 ^{d}	5.22±0.03 ^{c}	4.95±0.07 ^{b}	4.72±0.04 ^{a}
Day 64	5.29±0.05 ^{d}	5.06±0.03 ^{c}	4.79±0.05 ^{b}	4.61±0.06 ^{a}
Day 177	5.60±0.02 ^{d}	5.37±0.05 ^{c}	5.25±0.07 ^{b}	5.09±0.04 ^{a}

CONCLUSIONS

- Less addition of dextrose (significant higher pH levels), more formation of (zinc) protoporphyrin IX.
- If pH > 5 during the production process (variation A and B), the fluorescence intensity remains constant until day 64.
- Only after an extremely long drying period (day 177), large increases of fluorescence intensity can be observed in all variations.

RESULTS

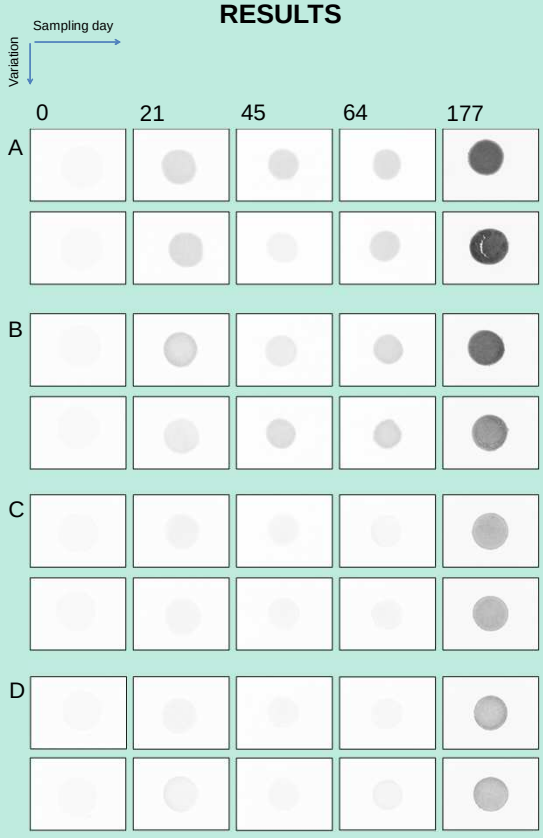

Figure 2. Evolution of (zinc) protoporphyrin IX using a fast screening method (red fluorescence is visualized by using image analysis of RAW images).

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